



Seat No. _____

HB-003-1204003

M. Sc. (Sem. IV) (CBCS) (W.E.E. 2016) Examination

April - 2023

ET-07 : Materials Characterization

Faculty Code : 003

Subject Code : 1204003

Time : $2\frac{1}{2}$ Hours / Total Marks : 70

- Instructions :** (1) All questions carry equal marks.
(2) Full marks are indicated at the right end of each question.
(3) Symbols have their usual meanings.

- 1** Answer any SEVEN of the following : **14**
- (a) What are White Radiation X-rays ?
 - (b) Why Ka transition is a doublet in case of Cu used as a Target?
 - (c) What is the d-spacing formula for orthogonal crystals ?
 - (d) Why 001 and 100 appear as separate lines in the XRD pattern of Tetragonal BaTiO₃ while overlap and exist as a single line in the same of Cubic BaTiO₃ ?
 - (e) Differentiate STM and SFM with reference to their working principles.
 - (f) What is TGA? Describe Dynamic TGA, Isothermal TGA and Quasistatic TGA.
 - (g) Give names of Ferroelectric Crystals.
 - (h) Define "CHROMOPHOROUS".
 - (i) Write a statement of Beer's Law.
 - (j) Write two essential criteria for a compound to absorb IR radiation.

- 2** Answer any TWO of the following: **14**
- (a) What are X-rays ? Explain the generation of characteristic X-rays in detail.
 - (b) Discuss the Effect of Stress on the Powder Pattern in detail.
 - (c) Discuss the Effect of Crystal Size on the Powder Pattern in detail.
- 3** Answer both both of the following: **14**
- (a) Discuss Scanning Electron Microscopy (SEM) with reference to Physical Basis of Operation, Instrumentation and Sample Requirements.
 - (b) Discuss Transmission Electron Microscopy (TEM) with special reference to Basic Principle, Resolution, Sensitivity, Image Mode and Sample Preparation.
- OR**
- 3** Answer both of the following: **14**
- (a) What is FTIR ? Write a note on molecular vibrations.
 - (b) Write a brief note on SQUID.
- 4** Answer any two of the following: **14**
- (a) Draw a block diagram of typical TGA set up. Explain each part in detail.
 - (b) Discuss UV-viz technique in detail.
 - (c) What is the importance of two point and four point probes resistivity measurement? Describe Van der Pauw method of resistivity measurement.
- 5** Write Short-notes on any two of the following: **14**
- (a) STM and SFM
 - (b) A Powder Pattern as a Crystal's Finger Print
 - (c) Ferroelectricity
 - (d) DTA and DSC.